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EXAMINER	
ROBINSON, LAUREN E	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/554,167	GAMBARELLI ET AL.
	Examiner	**Art Unit**
	LAUREN ROBINSON	1794

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) *3,6,8,10 and 15-21* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,5,7,9 and 12-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

The examiner notes that according to the MPEP 710.06 and in response to the applicant's letter regarding the last Office action not being received, the following corrective action is taken.

The office action mailed 9/11/2007 is reprinted below and is herein remailed. The period for reply of [6] MONTHS set in said Office action is restarted to begin with the mailing date of this letter.

Claim Objections

1. Claims 3, 6, 8, 11, 15-21 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim should refer to other claims in the alternative only and cannot depend from any other multiple dependant claim. See MPEP § 608.01(n). Accordingly, the claims 3, 6, 8, 11, 15-21 are not being further treated on the merits.

2. Claims 1-2, 4-5, 7, and 9-10, and 12 are objected to because of the following informalities: The objected claims above refer to a "procedure" for making a ceramic manufacture but the conventional manner in which a procedure should be claimed is a "method" for making a ceramic manufacture. Also…

Consider claim 1: The phase in the applicants' procedure claiming that insufflation of air during the traditional firing at 1200^{o}C; said insufflation being designed to produce **and** improvement in the photocatalytic effect of the titanium dioxide is object to due to "and" in this phase needing to be "an".

Consider claim 7: The applicants' said “Megalite”, “Zeolite”, and “Petalite” are capitalized when substances should not be.

Consider claim 12: The terms “Anatase” and “Rutile” are capitalized when they need not be.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 2, and 4-5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Consider claim 2: The applicant claims that the procedure of claim 1 is characterized by the fact that the presence of titanium dioxide in the single manufacture “may” vary from 1% to 25%. The term “may” is indefinite because it does not particularly point out a range but rather it leaves the claim open for interpretation that the percentage of titanium dioxide “may” be in the 1-25% range but does not necessarily have to be.

For purposes of applying prior art, the examiner interprets the claim to mean that titanium dioxide can be in the range of 1 to 25% but does not have to.

Also, the applicants' claim that the percentage of titanium dioxide is in the single manufacture is unclear because the single manufacture is considered the tile, etc. and the applicants' disclosure states that the percentage of titanium dioxide is in the composition coating in between 1 and 25% and not the overall manufacture.

For the purposes of applying prior art the examiner interprets the single manufacture to be the composition that it is present in.

Consider claim 4: The applicant uses the term "preferably" which leaves the claims indefinite due to the fact that "preferably" leaves the claim open for interpretation that the materials in claim 4 do not necessarily have to be the one claimed but rather the one claimed is "preferable".

For purposes of applying prior art, the examiner interprets the claim to mean that the preferable material might be present but does not have to.

Consider claim 5: The applicant uses the term "preferably" which leaves the claims indefinite due to the fact that "preferably" leaves the claim open for interpretation that the application in claim 5 do not necessarily have to be the one claimed but rather the one claimed is "preferable".

For purposes of applying prior art, the examiner interprets the claim to mean that the preferable material might be present but does not have to.

Also, the claim stating that the application is done by means of an "airbrush without air" is indefinite because it is considered an oxymoran and would be interpreted

as merely a brush and the application would then be to brush the titanium dioxide on with pressure.

For the purposes of applying prior art, the examiner interprets the claim to mean that the application is done with a brush (brushing on) and it is done with pressure.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 12-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Rohrbaugh et. al. (US Publication No. 2002/0045010).

The examiner takes the position that claims 13 and 14 are product-by-process claims. According to the MPEP section 2113 [R-1], even though these claims are limited to and defined by the process, determination of patentability is based on the product itself and does not depend on the method of production.

Rohrbaugh et. al. teach materials for coating, methods and articles of manufacture comprising a nanoparticle system to create multiuse benefits to modified hard surfaces (abstract). The said benefits include soil removal, anti-soil deposition, self-cleaning, enhanced gloss (must be present to be enhanced), enhanced color, and the release of actives (abstract). This reference teaches that a metal oxide can be used in the coating and one that has been used contains an effective amount (Pg. 9, Col. 2,

Par. 0104) of photoactive nanoparticles such as titanium dioxide, which functionalizes hard surfaces exposed to outdoor levels of UV (Pg. 1, Col. 2, Par. 0007) and is known to be photocatalytic (Pg. 1, Col. 2, Par. 0008). Rohrbaugh et. al. teach that this coating can be used to improve the surfaces of ceramic, stone (Pg. 2, Col.1, Par. 0010), porcelain dishware, stoneware, hard paste (known as porcelain) (Pg.4, Col.1, Par. 0040) and stone tiles (Pg. 20, Col.1, Par. 0231). The said "titanium dioxide is taken to be rutiles, anatases, and amorphous" and is used to degrade organic pollutants, increase refractive index, and is also used as a support for dye solar cells (Pg. 6, Col. 2, Par. 0065).

The reference's disclosure includes that the coating material can be in a composition form comprised of a non-photoactive nanoparticle (magnesium silicate compound claim 48), an effective amount of photoactive nanoparticles, and one or more adjunct ingredients (Pg. 9, Col. 2, Par. 0104) such as colored speckles that can enhance color, photoactivators, fungicides (Pg. 9, Col. 2, Par. 0102), antimicrobial preservatives, zeolites, (Pg. 16, Col. 1, Par. 0195), and photocatalytic metal oxides, and solubilizing agents (Pg. 19, Col. 1, Par. 0225) to enhance physical characteristics. The said composition can be in the form of granules, pastes, liquids, etc. and mixtures thereof (Pg. 7, Col. 2, Par. 0077) and since the composition was added to the glaze as mentioned previously, the zeolite is also added to the glaze. Rohrbaugh et. al. also teach that the method of coating using the steps of applying the composition, drying the coating composition, and then repeating either of the steps (Pg. 3, Col.1 Par. 0022). The said drying step can be done by using any technology known for accelerating

drying and curing such as forced (insufflation) air drying during the application of heat at elevated temperatures (Pg. 20, Col. 1-2, Par. 0234). The coating is applied to the surface on top of an initial gloss (glaze; claim 38) by painting, wiping, spraying (self-pressurized), etc. (Pg. 8, Col.1, Par. 0085) and the concentration of titanium dioxide in the ceramic can be all the way to 100% due to the idea that the nanoparticle can be applied alone in the form of a powder (Pg. 7, Col. 2., Par. 0082). While this non-limiting case can occur, the reference also discloses that metal oxide sols (silica, titanium oxide, etc) containing 10 to 50% of the metal oxide and when the sol is applied, it contains pores (channels) in the covering (Pg. 6, Col. 2, Par 0068).

The product made by this reference of porcelain ware and/or stone ware comprised of titanium dioxide in anatase and/or rutile phase that gives the product photocatalytic activities against environmental conditions is equivalent to the applicants' claims 12 through 14 although the process of making the said product is somewhat different.

Claim Rejections - 35 USC § 103

5. Claims 1-2, 4-5, 7, and 9-10 are rejected under 35 U.S.C. 103(a) as being obvious over Rohrbaugh et. al. (US Publication No. 2002/0045010) in view of Kuchinski et. al. (US Patent No. 6001494), Boire (US Patent No. 6103363), Hanson (US Patent No. 4267209), Tsujimichi et. al. (US Publication No. 2001/0036897), and of Kamen et. al. (Patent No. 5585153).

Rohrbaugh et. al. teach materials for coating, methods and articles of manufacture comprising a nanoparticle system to create multiuse benefits to modified hard surfaces (abstract) as mentioned above. However, **they are silent with regard to the paste being silk-screen, an engobe (slip) being present, materials present that absorb nitrogen oxides, the channels that are present being present to increase permeability, the refracting material being a white pigment, the thickness being uneven and designed to increase exchange surface, the magalite being present to absorb nitrogen oxides, using a screening machine and silicon roller to apply layer and create unevenness to thickness in the method, and firing at 1200°C.**

<u>In reference to the refracting material being white pigments</u>

While Rohrbaugh et. al. are silent with regard to the materials increasing refraction of light being white pigments and silica, Rohrbaugh et. al. teach adjunct materials such as silicates and aluminosilicate materials (Pg. 17, Col. 2, Par. 0208) are used as well as titanium dioxide. Due to both the silicate materials and titanium dioxide being highly reflective, the teaching that titanium dioxide increases refractive index, and that these said materials are comprised of white pigments, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Rohrbaugh et. al.'s teaching to include that the above silicate materials and titanium dioxide are comprised of white pigments.

<u>In reference to magalite being present, an engobe being present and firing the product at 1200^{o}C</u>

Kuchinski et. al. teach a metal-ceramic composite coating providing products with anti-corrosion enamel wherein the coating is considered a frit that can be made of silica, zinc oxide, etc.(abstract). The reference teaches that the new coatings use existing frits and porcelain (hard paste) enamel manufacturing and application equipment and the thickness of the coatings vary (uneven) from 1 to 10mm due to variations in the compositions (Pg. 1, Col. 1, Par. 4-5). Kruchinski et. al. also teach that titanium dioxide and magnesium oxide can be present and the titanium dioxide can be present in the composition at 0 to 10% by weight (Pg. 2, Col. 1, Par. 3). The said frit in the reference's disclosure can then be crushed and wet (water) milled with clay forming a slip (engobe) and then metal (such as magnesium; Pg. 3, Col. 2, Par. 7)) powder can be passed through a 325 mesh screen and the powder that does not remain on the screen can be added to the slip (engobe) (Pg. 1, Col. 2, Par. 1). According to US Patent No. 3865778, magnesium oxide passing through a 300-325 mesh screen is known as magalite D. The metal being added to the said composition where in this example it is the magnesium being added as a powder to enhance the color or gloss (gloss/glaze must be present to enhance it), corrosion, oxidation, environmental resistance, stability against electromagnetic radiation, heat exchangers, etc. of the overall product (Pg. 2, Col. 2, Par. 4). The final coating and product is then dried and fired at a temperature in between 500 and 1000^{o}C (Pg. 2, Col. 2, Par. 3) but the reference discloses that firing

temperatures can be varied to optimize performance/cost tradeoffs (Pg. 3, Col. 2, Par. 7).

Kuchinski et. al.'s teaching of a metal-ceramic coating with an uneven thickness comprised of a frit (containing titanium dioxide in a percentage), a slip (engobe), a mesh screen magnesium powder (magalite) wherein the coating (which can be porcelain enamel) can be fired at varying temperatures is related to Rohrbaugh et. al.'s teaching of a coating comprised of titanium dioxide, zeolite and a glaze due to the attempt to comprise a coating to enhance color and gloss, increase refractive index of UV and abate pollutants (such as oxidizing) in both references.

While Rohrbaugh et. al. are silent with regard to an engobe being present, the examiner interprets the slip of Kuchinski et. al. teaching to be equivalent to an engobe due to an engobe being defined as a clay slip, often white or cream and contain substantial amounts of silica, sometimes approaching the composition of a glaze. Since Rohrbaugh et. al. teach that a hard paste porcelain surface can be improved with a coating (such as the enamel coating of Kuchinski et. al.'s teaching) comprised of titanium dioxide and one or more adjunct materials to enhance color and gloss and Kuchinski et. al. teach that the materials added to the coating enhance color and gloss, then it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the slip (engobe) material containing titanium dioxide, silica, and an adjunct material to enhance gloss and color in Rohrbaugh et. al.'s coating where a gloss is present.

Also, while Rohrbaugh et. al. are silent with regard to zeolite being present with magalite, they disclose that an effective amount of photoactive particles can be present in the coating composition and can be titanium dioxide and/or other inorganic metal oxide such as magnesium oxide as one of the adjunct materials. From Kuchinski et. al.'s teaching, the metal powder that was added to the coating composition (engobe) with titanium dioxide was magnesium which was passed through a screen to form magalite to enhance oxidation, etc.. Although Kuchinski et. al.'s teaching mentions that magnesium oxide can be present with the titanium dioxide but only mentions magnesium rather than magnesium oxide passed through the screen and then adding the metal to the coating, the definition of magalite being magnesium oxide passing through the same size screen would provide obviousness that the magnesium passed through the screen could also contain an oxide (metal oxide). Also, since this said metal is used against electromagnetic radiation, which titanium dioxide is also used for, then it would have been obvious to one with ordinary skill in the art to modify Rohrbaugh et. al.'s teaching to include as one of their inorganic metal oxides with titanium dioxide to be magnesium dioxide passed through a 325 mesh screen (magalite) that was added to the engobe.

Furthermore, although Kuchinski et. al. teach that the ceramic and coating can be fired between 500 and 1000^{o}C but is silent with regard to the applicants' claimed temperature, they include that various temperatures can be used to optimize performance/cost. Due to this disclosure, it would have been obvious that the ceramic and coating in Kuchinski et. al.'s teaching could be fired at 1200^{o}C depending on ones

goal to enhance performance and cost. Therefore, while Rohrbaugh et. al. teach that the final product with the coating equivalent to Kuchinski et. al.'s teaching can be heated to high temperatures while forced air drying (insufflation) but is silent with regard to firing at the claimed elevated temperature, it would have been obvious to one having ordinary skill in the art at the time the invention was made to include in Rohrbaugh et. al.'s teaching that the product with the coating could be fired at an elevated temperature of 1200^{o}C depending based on the goal to enhance performance and cost.

In reference to materials being added to absorb NO_x

Tsujimichi et. al. teach a formulation comprising titanium dioxide as a photocatalyst and an amphoteric metal oxide or a base metal oxide. When a nitrogen oxide comes into contact with titanium dioxide upon light exposure (photocatalytic activity), the carbon monoxide is oxidized to nitrogen dioxide gas by hydroxyl radicals from the active oxygen species produced by titanium dioxide (abstract). The said nitrogen dioxide is chemically bonded to the oxygen atom and held on the metal oxide to be kept close to the titanium dioxide as the photocatalyst (abstract). This application is used for air purification where nitrogen oxides in the air are then oxidized with the oxygen to form nitric acid (Pg. 1, Col. 1, Par. 1) when water is on the surface. The reference discloses that the formulation composition is placed on a ceramic substrate and bonded by a binder (paste) and the metal oxide can be magnesium oxide (claims 3, 4, and 10). Tsujimichi et. al. also teach that a glazed tile can be used as a substrate but the substrate can also be stone, etc. and the coating can be applied by means of spray

coating, dip coating, brush coating, etc.(Pg. 26, Col. 1, Par. 5). The disclosure also states that when the substrate is a tile, an enamel or a pottery, a glaze or a print layer may be applied for supplying color to the surface (Pg. 16, Col. 1, Par 5-Col. 2, Par. 1) The amount of titanium dioxide added to the formulation was 0.001 to 10% of the overall composition (Pg 20, Col. 1, Par. 1) and the thickness of the coating was varied from 0.01 to 3.0m (Pg 5, Col. 2, Par. 3). The titanium dioxide was added as a sol (Pg. 20, Col. 1, Par. 1) and the pores that were formed on parts of the surface help absorb nitrogen dioxide (Pg. 1, Col. 1, Par. 4). The substrate and the coating in this disclosure were then fired at a temperature determined by taking into consideration the melting temperature of silica which is used to fix the titanium dioxide and the melting temperature of titanium dioxide and metal oxide (Pg. 11, Col. 2, Par. 5).

Tsujimichi et. al.'s teaching of a coating comprised of titanium dioxide and metal oxide with a binder applied to a glazed ceramic material to absorb nitrogen oxides is related to Rohrbaugh et al.'s teaching due to the attempt to improve photocatalytic activity using titanium dioxide and/or other metal oxides.

While Rohrbaugh et. al. is silent with regard to materials being added to the surface to absorb nitrogen oxides, Tsujimichi et. al's teaching of a formulation (coating) comprised of titanium dioxide and a metal oxide wherein if the titanium dioxide comes into contact with a nitrogen oxide upon light exposure then a carbon monoxide is oxidized to nitrogen dioxide and the nitrogen dioxide is bonded to the metal oxide is equivalent to material absorbing nitrogen oxides. Tsujimichi et. al.'s teaching is equivalent to the surface absorbing nitrogen oxides since the metal oxide is inside the

coating layer and if the nitrogen dioxide is bonded to it, then this in turn means that the nitrogen dioxide was absorbed. Also, since Rohrbaugh teach that the titanium dioxide is used for coatings on products that are exposed to outdoor levels of UV and further add a adjunct material which can be a metal oxide (wherein metal oxide is what holds onto the nitrogen dioxide in the coating or in the engobe as found obvious previously), then it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Rohrbaugh et. al.'s teaching to include that there is a metal oxide material present on the coating that absorbs nitrogen oxides when abating pollutants in the atmosphere.

In reference to magalite being with a zeolite being present as the materials to absorb NO_x

Kuchinski et. al. teach a metal-ceramic composite coating providing products with anti-corrosion enamel wherein the coating is considered a frit that can be made of silica, zinc oxide, etc.(abstract) wherein magnesium oxide can be added to titanium dioxide in the form of magalite as mentioned above but they are **silent with regard to the magalite being in the coating enamel to absorb nitrogen oxides.**

Tsujimichi et. al. teach a formulation comprising titanium dioxide as a photocatalyst and an amphoteric metal oxide or a base metal oxide such as magnesium oxide to absorb nitrogen oxides as mentioned above.

While it was previously found obvious to include that the magalite taught by Kuchinski et. al. could be used as one of the adjunct metal oxides with a zeolite adjunct

material in Rohrbaugh et. al.'s teaching to enhance physical properties such as electromagnetic, Kuchinski et. al. also disclose that the magalite can enhance oxidation when holding onto nitrogen dioxide. Although Kuchinski et. al. is silent with regard to magalite and a zeolite absorbing nitrogen oxides, Tsujimichi et. al. teaching that magnesium oxides (magalites) being the item that holds onto and absorbs nitrogen dioxides and that adjunct materials can perform as solubilizing agents and zeolite being an adjunct material that can be used shows that it would have been obvious to include in Kuchinski et. al.'s teaching that the magalite absorbs nitrogen oxides and that the zeolite helps make the surface soluble so that nitrogen dioxides can absorb into the surface and attach to the metal oxide. Also, since zeolites can be present with the magnesium oxide as discussed above, as adjunct materials working together, in Rohrbaugh et. al.'s teaching and zeolite is added to the composition and glaze, then it would have been further obvious to one with ordinary skill in the art at the time the invention was made to modify Rohrbaugh et. al.'s teaching to include that the modified magalite absorbing nitrogen oxides from Kuchinski et. al.'s teaching works together with the zeolite of Rohrbaugh et. al.'s teaching and together they absorb nitrogen oxides.

In reference to uneven thickness being designed to increase exchange surface and the channels being present to increase permeability

Boire teaches a ceramic-based substrate (made with silica; Pg. 4, Col. 2, Par. 6) with a coating with photocatalytic property containing titanium dioxide (abstract) in the anatase form (Pg. 1, Col. 2, Par. 2). The said coating can be considered a glaze (Pg. 1,

Col.1, Par.1) and can be used for materials such as tile, and architectural materials (Pg. 4, Col. 1, Par. 1). The reference teaches that the coating gives the substrate dirt repellent, anti-ultraviolet, antimicrobial, etc. properties (Pg. 4, Col. 1, Par. 2). The coating upon the addition of the said materials by dipping, cell coating, spray coating etc. (Pg. 4, Col. 1, Par. 9) has an increased refractive index and colorimetry (example 2) and the overall coating has a degree of roughness which enhances photocatalytic activity (exchange) (Pg. 2, Col. 2, Par. 3). The reference defined the degree of roughness to mean that the surface is not smooth and that there is induced porosity in at least a portion of the coating that enhances wetting properties (permeability) (Pg. 2, Col. 2, Par. 3-4). The said rough covering has a thickness that varies from 5nm to 1 micron (Pg. 3, Col. 1, Par. 2) making it uneven. The substrate and coating were then heated and reheated and can even have blowing (insufflation) over the substrate (Pg. 6, Col. 2, Test 1).

Boire's teaching of a ceramic-based substrate with an coating of titanium dioxide glaze with an uneven thickness and increase permeability due to pores is related to Rohrbaugh et. al.'s teaching of a coating comprised of titanium dioxide and a glaze due to the attempt to comprise a coating to enhance antimicrobial, photocatalytic, refraction and color properties of the substrate in both references.

While Rohrbaugh et. al. is silent is silent with regard to the thickness being uneven in order to increase the exchange surface with the atmosphere, Boire's teaching that a coating comprised of a photocatalytic titanium dioxide has enhanced photocatalytic activity when there is a degree of roughness having a thickness varying

from 5nm to 1micron is equivalent to the increased exchange surface with the atmosphere. Boire's teaching is equivalent due to photocatalytic activity being a reaction that takes place with light and since the roughness enhances photocatalytic activity due to reactions (exchanges) occurring between the surface and sunlight (atmosphere), this roughness enhance the exchange surface of the manufacture. Since both references teach a substrate with titanium dioxide to enhance photocatalytic reactions and Boire's also includes the photocatalytic properties are enhanced by uneven thickness, then it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Rohrbaugh et. al.'s teaching to include that the coating was uneven in order for the photocatalytic activity/reactions (exchange) with sunlight on the coating's surface to be enhanced (increased).

Also, while Rohrbaugh et. al.'s teaching is silent with regard to the channels (pores) that are present being designed to increase the permeability of water, Boire teaches that the induced porosity from the coating layer (in at least a portion of its coating) enhances wetting properties. Since there are pores present in Rohrbaugh et. al.'s teaching and the surface comes in contact with water and other environmental factors, then the pores would also have enhances wetting properties which is also known as permeability. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Rohrbaugh et. al.'s teaching to include that the pores present increase permeability with water which is taught by Boire.

In reference to a silk screen paste being present

Hanson teaches a method for decorating a surface of a ceramic article by applying medium comprising ceramic and inorganic material and a frit material. Hanson also teaches that magnesium oxide can be present in the frit at a molar weight of 0.09 (Pg. 4, Col. 1, Par. 1). The ceramic bodies referred to in this reference are wall tile, counter tile, and floor tile (Pg. 1, Col. 1, Par. 1). The said medium and frit that is applied is to decorate the tile and it is disclosed that this can be done by painting (brush), silk screening with a roller, etc. (Pg. 1, Col. 1, Par. 2). The method of silk screening in this reference states that the article is moved along a path and a selected design is applied by means of a ceramic and inorganic material (silk-screen paste) (Pg. 1, Col. 2, Par. 1). A granule composition is made by mixing selected frits and silica to form a powder like mixture (claim 9) and then mixed with a glaze (Pg. 1, Col. 2, Par. 4). The granules are then flowed to the ceramic composition on the articles (Pg. 1, Col. 2, Par. 1) and a glaze is placed on top (Pg. 4, Col. 2, Par. 5). The article is then fired at temperatures above 800^{o}F (Pg. 1, Col. 2, Par. 4). In the disclosure it is stated that the surfaces that include the said glaze covering after firing may be of any suitable color (Pg. 4, Col. 1, Par. 5).

Hanson's teaching of a method for decorating a ceramic tile article using frit (with metal oxides) and granular material with a silk-screen paste using a silk-screen machine and then firing the final product is related to Rohrbaugh et. al.'s teaching due to materials being added to a ceramic substrate as a coating in the form of paste and granules in both references to enhance the color and gloss of the surface.

While Rohrbaugh et. al. is silent with regard to a silk-screen paste being present with the gloss (glaze) and titanium dioxide coating, they include that the titanium dioxide coating can be used to improve the surface of hard paste, porcelain, stoneware, and stone tiles and adjunct materials in the form of paste or granules can be added to enhance gloss and color. Also, Hanson teaches that a ceramic and inorganic material, which forms a paste, can be applied to a tile by the method of using a silkscreen machine. By Hanson teaching a paste, which includes a ceramic (which may be porcelain) and an inorganic material (which may be titanium dioxide), applied by silk screening means that the paste is considered a silk-screen paste. Also since Hanson teaches that a ceramic granular composition (adjunct material) that is mixed with glaze is added to the adhesive (paste) coating means that there is a glaze (or gloss in Rohrbaugh et. al.'s teaching) present, which will further enhance the color and surface.

Furthermore, while Rohrbaugh et. al. teach that titanium dioxide coating is applied to a hard paste (porcelain) or stone/tile enhances the surface and an adjunct material in the form of a granules is added to enhance color, the paste applied to a tile in Hanson's teaching, which is comprised of a ceramic (porcelain) and inorganic (titanium dioxide) material, has granules also added to enhance the color. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Rohrbaugh et. al.'s teaching to include that the coating that improves the surface of tile/stone/porcelain etc. is comprised of some ceramic porcelain material and titanium dioxide (inorganic) and applied to the tile by silk screening which

forms a silk screen paste. Then granules (adjunct material) can be added to enhance the color to can be the silk screen paste applied by silk screening in Hanson's teaching.

In reference to a screening machine using a silicon roller to apply uneven areas and layers

Hanson teaches a method for decorating a surface of a ceramic article by applying medium comprising ceramic and inorganic material and a frit material by the method of a silk screening machine. This reference also teaches that the tile is moved along a path where the ceramic (may be porcelain) and inorganic material (may be titanium dioxide) is applied to the tile directly with a roller and the granules and glaze are flowed to the tile, but they are **silent with regard to the roller being a silicon roller.**

Kamen et. al. teach a method for applying a decorative coating (abstract) to a glass or ceramic article (Pg. 1, Col. 1, Par. 4). This reference also discloses that roll-on methods can be performed using a silicon rubber roller (Pg. 1, Col. 1, Par. 3) or a silk screen method (Pg. 2, Col. 2, Par. 3) using rollers made by Silicon Limited. Since Kamen et. al. teach a method for placing a decorative coating onto a ceramic substrate by using a silicon roller and silk screen process, then this is related to the method for decorating the surface of a ceramic article in Hanson's teaching which uses a silk screen machine to apply the coating and Rohrbaugh et. al.'s teaching which uses a coating for a ceramic tile.

While it was previously found obvious to include that the uneven and porous coating taught by Boire to increase exchange and permeability could be used as the coating in Rohrbaugh et. al.'s teaching and it was also determined obvious that the coating in Rohrbaugh et. al.'s teaching could be applied to the ceramic substrate directly using a silk screen machine and method with a roller, then the modified coating with the uneven and porous thickness and surface could be applied to substrate using the silk screen and method. Also, since the modified coating contains pores and varying thickness, the method of choice to apply the coating would have to have been involved in the uneven thickness and dispersal, which would lead to various porosity to enhance physical properties. Furthermore, since it was also determined obvious previously that the method to apply the coating of Hanson's teaching which includes a silk screen machine and roller directly to a tile surface could be used in Rohrbaugh et al.'s teaching then the modified coating would be applied also using this method. Therefore, although Hanson is silent with regard to the roller being used being made of silicon and the uneven and porous areas being made by means of a silk machine and silicon roller, it would have been obvious to one having ordinary skill in the art at the time the invention was made to include that the method of Rohrbaugh et. al.'s teaching that was modified could be further modified to include that the roller was made of silicon and that the modified uneven and porous coating was applied using this method and upon varying thickness and coating dispersal, the pores and unevenness were created by the silk screen silicon roller.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAUREN ROBINSON whose telephone number is (571)270-3474. The examiner can normally be reached on Monday to Thursday 6am to 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carol Chaney can be reached on 571-2721284. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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